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MOLLUSCA OF GLACIER NATIONAL PARK, MONTANA.

BY S. STILLMAN BERRY.

INTRODUCTION.

During the month of August, 1916, in the course of a brief vacation in the Glacier National Park, Montana, the writer incidentally made a small collection of mollusks, which, though doubtless not in any way complete for even those portions of the region visited, is none the less of considerable interest, particularly from the standpoint of the zoogeographer. The facts, that within the boundaries of this Park the three principal continental watersheds find their point of junction, and that collections were made on all three sides of the continental pinnacle thus formed, give a peculiar interest to the records. To the great, rough, triangular rock called Triple Divide Peak, belongs the honor of being, at least so far as drainage goes, the top of the North American Continent. One of its three faces drains into Norris and Red Eagle Creeks, and thence via the St. Mary's and Saskatchewan Rivers into Hudson's Bay; one drains into Cut Bank Creek and thence via the Marias River and the Missouri-Mississippi into the Gulf of Mexico; the third drains via Nyack Creek and the Flathead and Columbia Rivers into the Pacific.

This will suffice to indicate why the student of geographical distribution must find a peculiar interest in the elucidation of the fauna of the region, though unfortunately the present collections are not sufficiently complete that any very general conclusions may be safely drawn, even for the single phylum Mollusca. They were carried out at odd moments along the trail or while stopping to rest, and nowhere was it possible to make them reasonably exhaustive.

The writer was accompanied on the entire expedition by Mr. Elwyn H. Dole, of Winnecock, Montana, and during the latter part of the tramp by Dr. A. H. Warthin, of the University of Michigan, and his son, Master Aldred Warthin. His thanks are due to each of these gentlemen for help in the work of collecting, as well as to Mr. E. G. Vanatta, of The Academy of Natural Sciences of Philadelphia, for his critical comparison of certain specimens with others in the collections of the Academy.

The total number of species taken was not large—some eleven of land snails and a single freshwater bivalve—but several con-

stitute new records for the state, and one, the interesting *Polita chersinella* (Dall), has previously been known only from the Californian Sierras. One subspecies, *Oreohelix cooperi apiarium* is here described as new. *Euconulus fulvus (alaskensis ?)* proved by all odds the most abundant and widely distributed species in the Park, being taken at 14 of the 18 stations. Other relatively abundant forms are *Vertigo modesta parietalis* (a good second to *Euconulus*), *Oreohelix cooperi apiarium*, and *Thysanophora ingersolli* (though for both of these last two species the figures to be quoted include dead shells). We did not discover how to find the *Oreohelix* or the *Polita binneyana* until toward the end of the trip, else the figures for each of these might have been larger.

It is evident that the fauna as a whole exhibits a markedly boreal or Hudsonian aspect, in which the occurrence of such species as *Oreohelix cooperi apiarium*, *Polita chersinella*, and *Punctum californicum* seems more or less anomalous. Quite unexpectedly the list is an altogether different one from that collected by the late Mr. L. E. Daniels in the Bitter Root Mountains and reported upon by Mr. Vanatta in these PROCEEDINGS for 1914 (Vanatta :14). Though his list is a much more extensive one, some seven species, or just one more than half of those here recorded, fail to appear therein.

A first duplicate series of the specimens taken has been deposited in the collections of the Academy.

HISTORICAL.

In my search of the literature I have been unable to discover any previous record of Mollusca taken within the actual confines of the Glacier National Park with the single exception of a note by F. C. Baker (:14, p. 106), wherein he mentions finding some dead shells of *Oreohelix cooperi* "at Glacier National Park, Montana, in a ravine about a mile west of the hotel."

Some collecting was done by Dr. G. M. Dawson in 1874, and Mr. J. B. Tyrrell in 1883, just north of the present Park near Waterton Lake on the Canadian side of the boundary, and *Oreohelix cooperi limitaris* (*Helix limitaris* Dawson) was described from the material taken, but most of the records seem never to have been published.

LIST OF STATIONS WITH DATA.

The recorded stations from which mollusks were taken on this expedition are eighteen in number, being in consecutive order as

follows. Two of the stations (I and XVIII) are really extralimital to the Park:

Station I. Mt. Henry Trail, 3 miles northwest of Glacier Park Station, just outside the eastern boundary of the Park; alt. 5300 ft.; August 20, 1916; under sticks and bits of bark in moist places along the trail.

Station II. Mt. Morgan Trail, Dry Fork Canyon; alt. 5200–6000 ft.; August 21, 1916; under sticks, stones, etc., at various intervals along trail; most of the Vertigos found under one small log.

Station III. Cut Bank Creek; alt. 5800 ft.; August 21, 1916; under sticks not far from creek.

Station IV. North Slope Triple Divide Pass; alt. 6600 ft.; August 22, 1916.

Station V. Near Going-to-the-Sun Chalets, Gunsight Trail; alt. 4600 ft.; August 25, 1916; among loose rocks on slope near trail. (Plate IX, fig. 1.)

Station VI. Piegan Pass Trail, on west slope of Going-to-the-Sun Mountain; alt. 6000 ft.; August 26, 1916; under sticks except *Oreohelix*, which was crawling on surface.

Station VII. Lower end of Grinnell Lake; alt. 5000 ft.; August 26, 1916; under sticks.

Station VIII. Southeast shore of Lake Josephine; alt. 5000 ft.; August 26, 1916; under sticks.

Station IX. Along road northwest of Lake McDermott; alt. 5000 ft.; August 27, 1916; under sticks and bark. (Plate IX, fig. 2.)

Station X. Ptarmigan Falls; alt. 5600 ft.; E. H. Dole, August 27, 1916; under sticks, bark, etc.

Station XI. Pool near lower end of Iceberg Lake; alt. 6000 ft.; August 27, 1916. (Plate IX, figs. 2–3.)

Station XII. Upper end of Swiftcurrent Canyon; alt. 5200 ft.; August 28, 1916; under sticks and small logs on floor of canyon along trail. This station proved one of the most prolific of any at which collecting was done. (Plate IX, fig. 2.)

Station XIII. Granite Park Trail, just below Granite Park Chalets; alt. 6000 ft.; August 29, 1916; under sticks and small logs along trail.

Station XIV. Granite Park Trail, near Mineral Creek, at bottom of canyon below Granite Park; alt. 3859 ft.; August 29, 1916; mainly under sticks and pieces of bark around fallen logs along the trail. The best locality for small land snails we found in the Park. The forest in this canyon is magnificent and very dense.

Station XV. Granite Park Trail, bottom of McDonald Creek Canyon under Haystack Butte; alt. 3650 ft.; August 29, 1916; the Oreohelices found aestivating among a growth composed principally of *Rubacer*, *Ribes*, *Urtica*, *Fatsia*, and cow parsnip, the *Polita binneyana* in association.

Station XVI. Granite Park Trail, bottom of McDonald Creek Canyon opposite Glacier Wall; alt. 3550 ft.; August 29, 1916; same characteristic plant association as for preceding station.

Station XVII. Granite Park Trail, bottom of McDonald Creek Canyon, under Mt. Cannon; alt. 3450 ft.; August 29, 1916; same characteristic plant association as for preceding two stations.

Station XVIII. Belton, Montana, just outside southwestern boundary of Park; alt. 3300 ft.; E. H. Dole, August 30, 1916.

Reference to a map will show that Stations I-III are in the Atlantic drainage basin, IV-XII in the Arctic drainage basin, and XIII-XVIII in the Pacific drainage basin. The terrestrial species as a rule were found to occur in all three watersheds, but *Polita binneyana* and *Striatura milium pugetensis* were noted only on the Pacific side.

CENSUS OF SPECIES TAKEN.

The accompanying table gives a good idea of the relative abundance of the various species collected, both absolutely and with reference to the station and drainage data.

NOTES ON THE SPECIES.

Oreohelix cooperi apiarium new subspecies. Plate X.

The shell is large for this group of Oreohelices, strongly elevated, with an obtuse apex. The spiral sculpture is obsolete below, but strong on the upper half of the whorls where it consists of numerous fine striations, quite visible to the naked eye, which are interrupted by the coarse and very irregular lines of growth. The periphery is obtusely angular in front, becoming rounded or with just the faintest suggestion of angulation on the remainder of the last whorl. The umbilicus is narrow and deep, contained in the diameter about six times, its circular outline partially interfered with by the slightly reflexed inner lip.

The color is extremely variable, the ground color of the shell ranging from a very light brownish cream, almost white, through shades of yellowish brown to dark chestnut, and tones of gray to a livid brownish slate. The adult shell usually shows two narrow

TABLE SHOWING RELATIVE ABUNDANCE OF SPECIES TAKEN.

Drainage Stations	Atlantic										Arctic										Pacific									
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	No. Water-sheds	Total No. Specimens Collected	No. Stations	No. Water-sheds								
<i>Oreohelix cooperi apiarium</i> Berry.....																														
<i>Thysanophora ingersolii</i> (Bland).....	19																													
<i>Pyramisula cronicilaei</i> (Newcomb).....	2	2																												
<i>Puniceum californicum</i> Pilsbry.....	7																													
<i>Zonitoides arboreus</i> (Say).....	4	3																												
<i>Bucaniaulus tuberos clackensis</i> Pilsbry.....	1																													
<i>Polita binneyana</i> (Morse).....	8	13	1																											
<i>Polita chersinella</i> (Dall).....		2																												
<i>Striatura milium pugetensis</i> (Dall).....																														
<i>Vitrina alaskana</i> Dall.....		1	2																											
<i>Vertigo modesta parietalis</i> (Ancyey).....	8	23																												
<i>Pistidium abditum</i> Haldeman.....																														

¹ Dead shells only.

Total 761

darker bands, one on the shoulder, the other just below the periphery, with sometimes a broader light band between, and several weaker and narrower bands below extending upon the base of the shell. Entirely bandless specimens seem to occur but rarely.

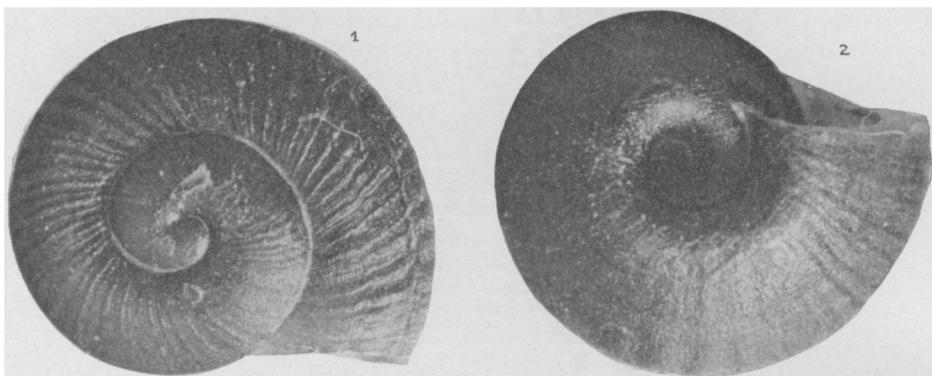


Fig. 1. *Oreohelix cooperi apiarium* new subspecies. Apical and basal views of shells of unborn young, taken from specimen shown in Pl. X, Fig. 2-2b (type). $\times 13$.

The embryonic shell is lenticular in outline and strongly carinate as usual in the genus. It is sculptured with numerous very fine, crowded, wavy, spiral striae, crossed on the neanic portion by coarser, but still narrow, rather irregularly spaced, wrinkle-like, incremental ridges, some of them eventually becoming almost rib-like above, but practically obsolete below the periphery, where, however, the fine spiral striation is in these young specimens beautifully developed.

	Largest from Station XVI (Type)	Smallest Adult Station XVI	Largest, Station XV
Maximum diameter.....	22.0 mm.	15.6 mm.	23.2 mm.
Minimum diameter.....	21.3 mm.	15.1 mm.	20.3 mm.
Altitude.....	19.6 mm.	15.4 mm.	18.0 mm.
Diameter of umbilicus.....	3.5 mm.	2.5 mm.	3.7 mm.
Number of whorls.....	6½	6	6
Illustration, Plate X.....	Figs. 2-2b	Figs. 7-7b	

Type.—Cat. No. 4130 of the writer's collection; paratypes in The Academy of Natural Sciences of Philadelphia, the University of Colorado Museum, and the California Academy of Sciences.

Type Locality.—Station XVI, altitude 3550 ft., McDonald Creek Canyon, opposite Glacier Wall, Granite Park Trail, Glacier National Park, Montana; 37 specimens.

Remarks.—Despite its great size, *O. c. apiarium* is nearer, I think, to *O. c. limitaris* (Dawson) than to any of the other described races of the *cooperi* complex. The latter differs in its very much smaller size, less elevation, rather greater carination of the front part of the last whorl, and very much weaker spiral striation on the upper portion of the whorls. Relative to the size of the shell the lines of growth are coarser in *limitaris*, and the adult shell has from $\frac{1}{2}$ to $\frac{3}{4}$ of a whorl less.

Limitaris has long been greatly misunderstood, and for a time I thought the Glacier Park race might prove to be identical with it, but the recent receipt of good comparative material from the type locality of *limitaris*, through the kindness of Mr. Frits Johansen, of the Geological Survey of Canada, has led me to the conclusion that the two are measurably distinct, though *limitaris* comes from near Waterton Lake, just over the border from Glacier Park, Montana.

If these conclusions are correct, both *apiarium* and *limitaris* will stand as reasonably well differentiated subspecies of *O. cooperi* (Binney). The McDonald Creek Canyon shells are among the most elevated and largest *cooperi* I have seen, being surpassed in bulk only by Pilsbry's *O. c. maxima* from the Yellowstone National Park. *Maxima* further differs in its more depressed contour and much more capacious umbilicus. For the loan of a specimen of *maxima* permitting my direct comparison of the two I am indebted to Dr. Pilsbry.

Another shell which is probably quite close is that represented by the three largest figures given by Elrod in his "Biological Reconnaissance in the vicinity of Flathead Lake" (:02, pl. 27), over the name of *Pyramidula strigosa*, var. They are from McDonald Lake, Mission Mountains, Montana, which should not be confused with the lake of the same name in Glacier Park near the type locality of *apiarium*. Not any of the shells he figures on the plate cited appear to me to be correctly referred to *strigosa*.

Most of the living specimens taken were found to contain unborn young. The number of embryos per adult varied so greatly that it is evident the smaller numbers did not represent entire broods, probably the last members of a clutch in progress of birth. Twenty specimens from Station XV yielded from 2 to 18 embryos each, the average being 11.6. At Station XVI 12 specimens yielded from 3 to 23 embryos each, the average being 14.5. Where but few embryos were found they proved generally to be above the average in size, which accords with the supposition that in such cases parturition was more advanced.

The dead shells from Station V on the Arctic side of the Divide are not typical of the race as here described. The same would probably be true of those taken at Station VI, were any of them adult.

Thysanophora ingersolli (Bland).

I do not recall having seen *Thysanophora* reported from so far north. However no special peculiarities have been detected in these specimens.

Pyramidula cronkhitei (Newcomb).

Not found as commonly as would naturally have been expected.

Punctum californicum Pilsbry.

This determination is due to Mr. Vanatta. The specimens are distinctly smaller, are much darker brown in color, and appear somewhat more coarsely striate than any Californian specimens of the species before me, and further, although the embryonic whorls are in both instances weakly spirally striate, they are much less distinctly so in the Montana form.

Zonitoides arborea (Say).

Found commonly only in McDonald Creek Canyon; scattering specimens elsewhere.

Euconulus fulvus alaskensis Pilsbry.

Wherever we went in the Park *Euconulus* was found not only to be ubiquitous but abundant.

Mr. Vanatta referred the shells sent him to typical *fulvus* rather than to *alaskensis*, but I am unable to effect a satisfactory separation of the remainder of the specimens from other Rocky Mountain *Euconulus* referred unquestioningly to the subspecies. Under a fairly high power (82 diameters), I can discover no trace of spiral sculpture on the earlier turns as in specimens of *fulvus* s. s. from Unity, Maine. Also there is "about one whorl more in shells of similar size"² for the Maine form, the color is noticeably paler, the axial sculpture finer, and the luster brighter.

Polita binneyana (Morse).

This was found principally in connection with the same peculiar plant association as *Oreohelix cooperi apiarium*, and attention to this fact should lead to its discovery at many other Stations than those

² Cf. Pilsbry and Ferriss, :10, p. 132.

at which we eventually ran across it, in which case it may prove to be of greater relative abundance than my figures indicate. The record is apparently a new one for the state.

Polita chersinella (Dall).

There is a decided discrepancy in the respective descriptions and figures given of *chersinella* by Dall and Binney, and it is perhaps not yet just certain what *chersinella* really is. However that may be, I am unable to distinguish the present specimens from material taken in the Californian Sierras, in spite of the tremendous jump in range. Compared with a somewhat larger specimen of the latter taken near Lake Tahoe by Mr. Allyn G. Smith, the largest of the Glacier Park shells has about one-half a whorl more, has rather more evenly rounded whorls and aperture, and a rounder, flatter spire. The generic position here adopted for the species is at best doubtful, but I feel convinced that it is *not* a *Euconulus*, a certain ease of confusing one's shells in the field with *E. f. alaskensis* notwithstanding. It has not been reported previously outside of California, where it is a characteristic alpine form.

Striatura milium pugetensis (Dall).

One would naturally anticipate that these shells would fall in line with their Washington neighbor, *pugetensis*, rather than with the far eastern form, yet Mr. Vanatta considers them "not typical of the var." but "nearer the regular *milium*." With the first part of the opinion quoted I concur, but not with the second. The Glacier Park shells are not only larger on the average (major diameter 1.67-1.85 mm.) than any (e. g.) Maine or Massachusetts *milium* I have seen, but possess the *strong spiral sculpture* of the first whorl and a half which is one of the striking features of the otherwise weakly differentiated *pugetensis*. Nor is the beautiful silky sculpture of the later whorls, particularly the last, which one sees in New England specimens and which has been so carefully described and figured by Morse ('64, p. 19, pl. 2, fig. 7), at all so exquisitely developed in the western shells.

As compared with specimens of typical *pugetensis* from Seattle, the Montana shells are notably larger, flatter, and coarser in appearance, slightly approaching in some respects the giant southern *meridionalis* Pilsbry and Ferriss. It may be that one day this mountain race will require a name of its own. Meanwhile the record is a new one for the state.

Vitrina alaskana Dall.

Noted frequently as indicated in the table, but nowhere observed in any abundance.

Vertigo modesta parietalis (Ancey).

The shells of this series show considerable variation. In some cases a considerable proportion of the shells (a respectable minority of those from Station XII, and a large majority of those from Stations I, II, and IX) have the angular lamella reduced to a mere trace or obsolete, thus approximating the typical *modesta*. Somewhat less than a third of all the adult shells taken are of this type, the balance being distinctly 5-toothed shells, i. e., true *parietalis*.

This *Vertigo* is abundant at suitable stations all through such portions of the Park as were visited.

Pisidium abditum Haldeman.

The specimens were hand picked from a small and very cold pool, but a few score feet from the partly frozen and perpetually frigid Iceberg Lake, at 6000 feet altitude, the highest elevation at which any Mollusca were obtained in the Park. Here they were abundant, and with a small sieve of the proper mesh many specimens could have been taken.

The specific determination is due to Mr. Vanatta.

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EXPLANATION OF PLATES

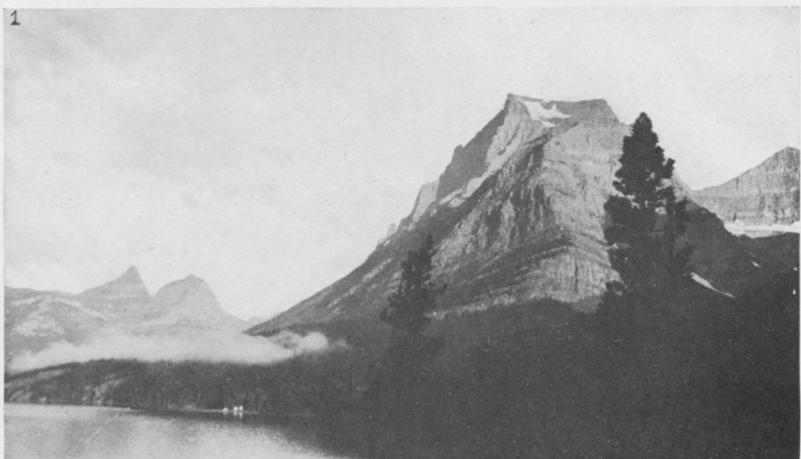
(Note: The illustrations on Plate IX are from photographs by the author. The specimen figures on Plate X were prepared by Mr. John Howard Paine.)

PLATE IX.—Fig. 1.—St. Mary Lake and Going-to-the-Sun Mountain from Going-to-the-Sun Chalets. Station V is in the woods above the Lake in the right foreground.

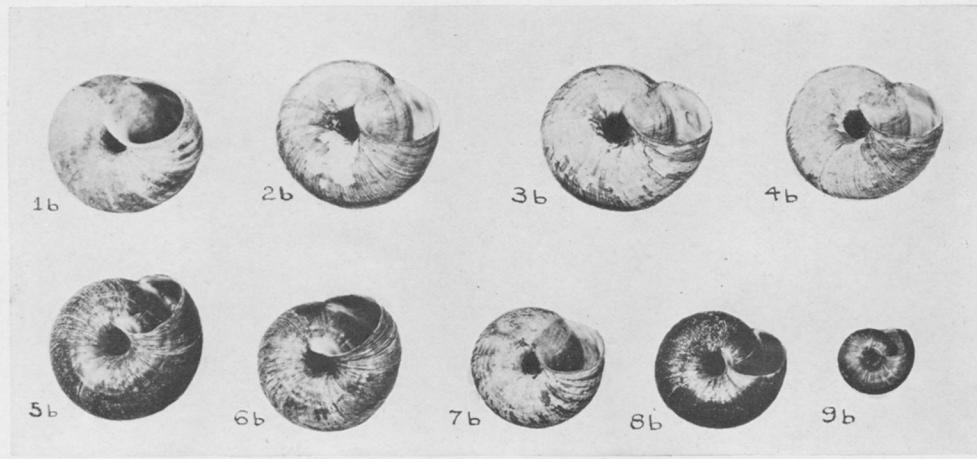
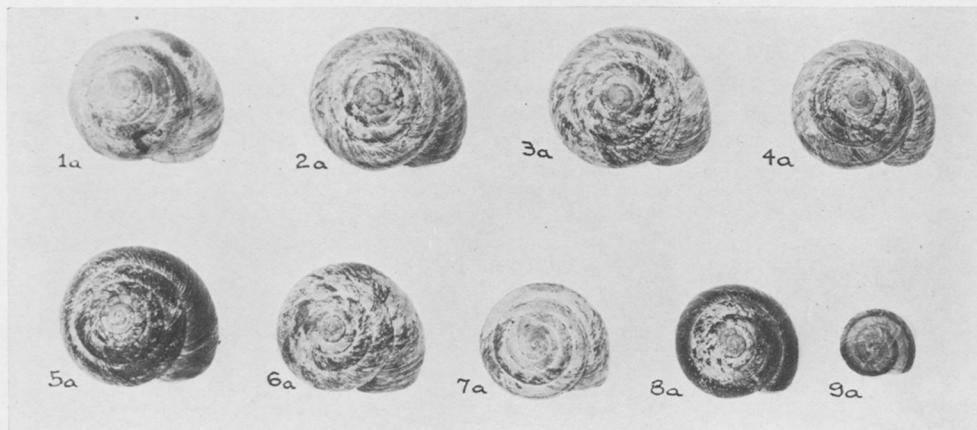
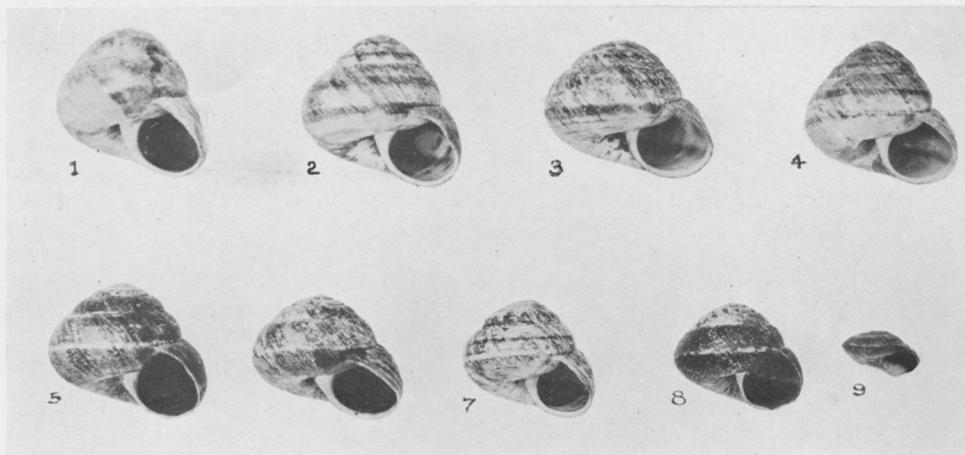
Fig. 2.—McDermott Lake, Mount Wilbur, Upper Swiftcurrent Valley, and the Continental Divide, from near the lower end of McDermott Lake. Station IX is in the woods beyond the tepees in the right center. Station XII is at the far upper end of the valley around the mountain shoulder at the left of the picture. Station XI is high up at the base of the steep glacial cirque in the distance to the right of Mount Wilbur.

Fig. 3.—Iceberg Lake. Station XI is a small pool a few rods from where the picture was taken.

PLATE X.—*Oreohelix cooperi apiarium* n. subsp. Series of nine specimens from the type locality, Station XVI, Cat. 3613 (excepting the type), Berry Collection. The type (Cat. 4130) is the shell shown in Fig. 2-2b. All figures natural size.



BERRY: MOLLUSCA OF GLACIER NATIONAL PARK.



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